“Classification of Image for Detecting Plant Diseases through Computer Vision”

A

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Table of Contents

Sr. No.	Title	Page No.
1.	Introduction	4
2.	Review of Literature.	5
3.	Objectives of Research	6
4.	Methodology	6
5.	Importance of study/ Society application	7
6.	Proposed Experiments	8
7.	References	9

Abstract:

In India 70% land is occupied with Agriculture. Especially, so many crops are taken by farmers around the year. But one crop that is very commonly taken by farmers is Banana. Banana is one of the most important fruit crop in India. The banana crop is taken around the year due to its taste, affordability, availability and its nutritive values. Banana plant is grown in humid tropical regions in India. According to AESA Report in India, banana ranks first in production and third among fruit crops. The banana production is highest in Maharashtra having highest productivity rate too.

As banana is dominant fruit in India; this fruit is get affected by number of diseases and pests. Due to this, plant growth and its quality and yield will automatically decreases. The problem of identification of diseases with conventional methods is not satisfactory. So, some advanced methods were used for timely identification of disease on the banana leaf. Computer Vision methods like Convolutional Neural Network may provide good frame work for identification of banana leaf diseases.

Introduction:

Agriculture is the backbone of different countries. Farmers spend lot of money on disease control without any technical knowledge, results in poor disease control. Mostly traditional method used by farmers i.e. by naked eyes diseases will identify by farmers which becomes too late for that crop and due to this farmers will lost the product [1]

For the better production of crop all care should be taken like analysis of soil, good quality seeds, nutrients for crop and many more. Even though all type of care should be taken, the big problem of agriculture which face the farmer is crop diseases. The plant diseases are occur due to climate change, then the diseases are transferred from one place to another i.e. globally very quickly and new diseases will occur that yet they will not identified.[2]

In crop production, Banana is popular and easily available fruit in the market. The price and quantity of product is easily affordable to all people. From Banana plant, different product are to be developed. So from early stage care should to be taken. As we said leaf is the important factor for good quality of any crop. If in the early stage the disease will identify we may have control on it and will get quantity and quality of product.

There are several application which are used by machine learning are computer vision, data retrieval, natural language processing etc. In the computer vision various sub discipline are presents like Object Classification, identification, detection, segmentation and recognition. The various key algorithm in computer vision is KNN (K Nearest Neighbor), SVM(Support Vector Machine), Naïve Bayes. [3][4]To identify diseases in early stage, in machine learning, image processing technique has to be used for image acquisition, image preprocessing, feature extraction and classification[5][6].Machine learning have Deep learning technique in which computer model learns the classification of images. Deep learning model will achieve state-of-the-art accuracy. Deep learning requires large amounts of labeled data. The deep learning also refers Deep Neural Network. Deep in the sense it have number of hidden layers in neural network that is it may contains more than 150 hidden layers where as traditional Neural Network contains 2 or 3 hidden layers. Mostly these layers are input layer, hidden layer and output layer.

The input layer receives input data The hidden layers perform mathematical computations on inputs. There are many other types of neural networks: Convolutional Neural

Networks for Computer Vision and Recurrent Neural Networks for Natural Language Processing.[7][8]

Review of Literature:

The problem of leaf disease detection has been an issue since long time and is of great concern in agriculture area for quality management of the crop. Some already proposed systems in the area are as explained below.

Basavaraj Tigadi1, Bhavana Sharma2 [9] "Banana Plant Disease Detection and Grading Using Image Processing" proposed work uses image processing technique to enhance the quality of image. The proposed system include several steps which include Image pre-processing, HOT feature extraction and artificial neural network. Artificial Neural Network algorithms used to classify Banana leaf diseases.

Bharat Mishra; Sumit Nema; Mamta Lambert; Swapnil Nema [10] Recent technologies of leaf disease detection using image processing approach — A review. This paper has analysis on different image processing technologies of leaf disease detection and classified them based on the type of analysis tool and applications. This paper tells some challenges like the background data affect the resulting image. Color, size and texture of leaf images will change according to climate. So in future there is scope of leaf disease detection.

Sandeep Kumar; KMVV Prasad; A. Srilekha; T. Suman; B. Pranav Rao; J. Naga Vamshi Krishna [11] Leaf Disease Detection and Classification based on Machine Learning. In this proposed work, plenty of images used for detection of leaf diseases. This paper helps to identify the disease that the leaf is affect. Different images of leaves are classified into database images and input images. Various segmented techniques used in this paper like K-means clustering for features Gray Level Co-occurrences Matrix(GLCM) and SVM(Support Vector Machine)used for classification of diseases. This helps to identify different diseases in leaves.

N. Kanaka Durga, G. Anuradha [12] Plant Disease Identification Using SVM and ANN Algorithms. This paper uses Support Vector Machine (SVM) and Artificial Neural Network(ANN) classifier for disease identification of maize and tomato plant. . Hence, these two plants disease identification by using Machine Learning. and the result is send to the customers by the use of Google Cloud Messaging (GCM) through the smart phone. The accuracy of plant disease identification is good using this technology.

Objective of Research:

Banana plant is grown in humid condition. Due to this environment condition, diseases are also increases.

- To study various existing methodologies available for Banana leaf disease identification.
- To design and develop a new effective and efficient tool for Banana leaf disease identification using Computer Vision .
- To test the developed tool for varied collection of Banana leaf disease identification.

Methodology

The main thing for disease identification is to prepare the dataset of banana images. The step contains image preprocessing. The proposed system consists of image acquisition, preprocessing, feature extraction, classification and disease identification. The diagrammatic representation of disease identification is shown as below.

Image acquisition is the action of retrieving an image from a source, like cameras, sensors, etc. This is the important step because without any image work will not flow for image identification. The main purpose of image processing is to improve the image data by enhancing the image feature and suppress the unwanted feature by reading, resizing data. Making new data from old one and converted RGB image into gray scale for computer computations. The segmentation of the image and identifying the position of the object of interest.

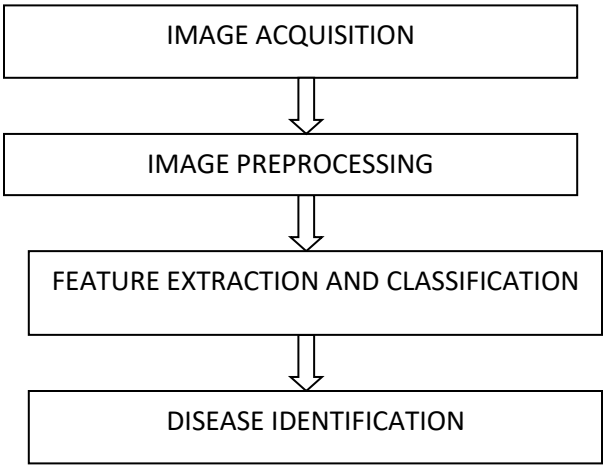

Fig:Block diagram of Disease Identification

Feature extraction and Training- In this step statistical or deep learning methods are used to identify the patterns of the image. The unique feature should identify which belongs to particular

class which helps for differentiating into different class. Training is nothing but model learns the feature from dataset.

Classification: The detected image classified into predefined classes by using specific classification technique which compares the image patterns with the target patterns.

There are several image classifier techniques i.e. SVM (Support Vector Machine).This algorithm depends on the kernel function which are mostly being used are- Linear Kernel, Gaussian Kernel and Polynomial Kernel.

Decision Trees: It is a supervised machine learning algorithm, is tree data structure only, which used if-else statements on the features selected which gives permission for acceptance and rejection of class labels at each intermediary level mK Nearest Neighbor: This algorithm simply relies on the distance between feature vectors and classifies unknown data points by finding the most common class among the k-closest examples.

Artificial Neural Networks: Artificial Neural Networks are statistical learning algorithms and are used for a variety of tasks, from simple classification tasks to computer vision.

ANNs are implemented as a system of interconnected processing elements, called nodes, which are functionally analogous to biological neurons. The connections between different nodes have numerical values, called weights, and by altering these values in a systematic way, the network is eventually able to approximate the desired function

Convolutional Neural Networks: CNN is most powerful image processing AI that uses deep learning to perform generative and descriptive task. Using multilayer perceptron, processing requirements has reduced. CNN have an input layer, an output layer and a hidden layer that includes multiple convolutional layers, pooling layers, fully connected layers and normalization layers.

Importance of Study/Society application

Deep learning has the drastic change in computer vision for image detection, segmentation, classification. Dut to object detection, image will classify into specific class from large numbe of images.According to traditional object detection, manually user need to design what feature they should extract. This process becomes high cost and time consuming.Due to Deep learning it have the ability of unsupervised feature learning which will find out the features of images without human interfarance by machine trained process.This means the complex problem will solve by

Neural Netwok as a result, neural networks can improve decision processes in computer vision. Using Convolution Neural Network banana leaf disease recognition is based on leaf image classification. This method is quick and easy system implementation and due to this in early stage diseases will identify and farmers will control over this diseases so that the quantity and quality of product will improve.

Proposed work plan:

1 In first phase doing the study of research topic using available literature.

2 In second phase, whatever data is collected related research work, analyze it for developing different technique.

3 Development of algorithm using computer vision in third phase.

4 In Fourth phase publishing the work (papers) in different journals and conferences and submit the Thesis.

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